

REMARKS

Claims 1-5 are pending in the above-referenced application and have been rejected by the Examiner. The rejections are traversed following.

Claims 1-2 and 4 are rejected under 35 U.S.C. § 102(a) as allegedly being anticipated by U.S. Patent No. 6,692,681 to Lunde (hereinafter referred to as "Lunde").

Lunde discloses a method of forming a composite body including the steps of, providing a mandrel body and placing a plurality of fibers on an outer surface of the mandrel body to form an uncured composite shell. The mandrel body and the uncured composite shell are surrounded by a bladder/caul sheet and placed in a clam shell mold which is held together with clamps during molding and curing of the composite shell. The mold halves are configured to create a clearance between the interior surface of the mold halves and the exterior surface of the uncured composite shell. Seals are provided for sealing the bladder/caul sheet and the composite shell to provide a sealed, leak-free system. (Lunde, col. 14, ll. 1-13). A vacuum pump is plumbed to a port on the clam shell and the air, or then gaseous fluidized material is evacuated from the sealed volume between the bladder/caul sheet and the clam shell molds. When this is done, the atmospheric pressure outside the sealed volume is higher than inside and tends to push the bladder/caul sheet and clam shells together. Since the bladder/caul sheet is stretchable and the composite shell is uncured, the external pressure tends to expand the bladder/caul sheet outwardly towards the rigid clam shells. The effect of the vacuum pressure is to expand the bladder/caul sheet away from the mandrel surface thus allowing the mandrel to be extracted. (Lunde, col. 14, ll. 17-39).

Next, the composite shell and clam shell molds are transferred to a controlled environment for curing and consolidation of laminates while the vacuum is drawn between the bladder/caul sheet and the clam shells. The composite shell is then cured in an autoclave wherein the autoclave is filled with gas such as nitrogen and then heated to increase the temperature. The pressure in the autoclave is then

increased to about 40 psi to about 100 psi. The vacuum between the bladder/caul sheet and the clam shell may be released after the autoclave pressure reaches about 15 psi or more. During the curing process, typically the temperature within the autoclave is increased to between about 340 ° F. and about 360 ° F. (Lunde, col. 22, ll. 9-40). Additionally, Lunde suggests that a vacuum source may be used during fiber placement to secure a bladder tightly against the mandrel so that it cannot move relative to the mandrel. See Lunde, col. 9, ll. 58-61).

In contrast, claim 1 of the present invention recites a method for forming a hollow FRP article by internal pressure molding. Claim 1 includes the steps of: positioning a FRP prepreg on a periphery of an airtight internal-pressure holding tube; inserting a composite body including said internal-pressure holding tube and the prepreg into a vacuum chamber containing a forming die, and evacuating the vacuum chamber in an isolation state wherein the composite body and the forming die do not contact each other. As clearly set forth in Applicants' specification, the evacuating step is to remove the air from the space between the composite body and the forming die so that air trapped therebetween does not cause irregularities in the surface of the composite body.

In the method of claim 1, a vacuum chamber containing a forming die and the composite body positioned within the forming die is evacuated in an isolation state wherein the composite body and the forming die do not contact each other. Thus, in claim 1, both the forming die and the composite body therein are positioned within a vacuum chamber and subject to the evacuation in an isolation state. Because both the forming die and the composite body are subjected to the evacuation inside the vacuum chamber, the air between the forming die and the composite body is removed while nothing causes the composite body to move towards an inside surface of the forming die. During the evacuation process the forming die is in an open position. Thus, in the claimed method, there is no difference in the atmospheric pressure inside and outside of the forming die as set forth in Lunde. Following the evacuation of the vacuum chamber, as also recited in claim 1, the

forming die is clamped together to bring the forming die and the composite body into contact with each other.

The Lunde reference does not teach a method of inserting a composite body including an internal-pressure holding tube and a prepreg into a vacuum chamber containing a forming die and evacuating the vacuum chamber in an isolation state where the composite body and the forming die do not contact each other as recited in claim 1. In the Lunde method a vacuum is maintained between an inner surface of a clam shell mold and a bladder/caul sheet surrounding the composite shell for the purpose of removing the mandrel. The vacuum causes the atmospheric pressure outside the clam shell is higher than that inside thereby causing the composite shell to be drawn toward and contact the clam shell. (See Lunde, col. 14, llo. 26-30).

Nothing in Lunde teaches placing a forming die containing a composite body in a vacuum chamber and evacuating the vacuum chamber. Further, nothing in Lunde teaches evacuating the vacuum chamber containing a forming die and composite body in an isolation state where the composite body and the forming die do not contact each other. Moreover, nothing in Lunde teaches or suggests the vacuum chamber required for carrying out the method of claim 1.

To support an anticipation rejection under 35 U.S.C. § 102, each and every element or limitation in the rejected claim must be disclosed in a single prior art reference used in the claim rejection.

As set forth above, the Lunde reference does not teach each and every element of claim 1 as arranged in the claim. Thus, it cannot be maintained that Applicants' claim 1 is anticipated under 35 U.S.C. § 102 by Lunde.

Claims 2 and 4 depends from amended claim 1 and also recites additional limitations. Since, claim 1 is not anticipated by Lunde for at least the above-identified reasons, dependent claims 2 and 4 are also not anticipated by Lunde.

Claims 1-5 are rejected under 35 U.S.C. § 103(a) as allegedly being unpatentable over U.S. Patent No. 6,352,662 to Murphy et al. ("Murphy") in view of U.S. Patent No. 6,143,236 to Nelson et al. ("Nelson"). Although the Office Action

states that claims 1-5 are rejected based on the combination of Murphy and Nelson, the Examiner's arguments are that claims 1-5 are unpatentable over Murphy in view of Lunde. The Examiner has failed to set forth the applicability of the Nelson reference to the pending claims. Accordingly, the rejection of claims 1-5 under 35 U.S.C. § 103(a) is traversed with respect to the combination of the Murphy and Lunde references.

Murphy discloses wrapping a mandrel with a bladder and a plurality of pre-preg plies for forming a shaft. The method including placing the wrapped assembly within a mold including a cavity having a predefined shape for the finished shaft. Pressurized gasses may be introduced to inflate the bladder forcing the pre-preg against the walls of the cavity. The mold may then be heated for curing the pre-preg. Thereafter the shaft may be removed from the mold, and the bladder and mandrel (if not already removed) may be removed from the core of the shaft. (See Murphy, col. 3, ll. 5-25).

As mentioned above, Lunde discloses a method of forming a composite body including the steps of, providing a mandrel body and placing a plurality of fibers on an outer surface of the mandrel body to form an uncured composite shell. The mandrel body and the uncured composite shell are surrounded by a bladder/caul sheet and placed in a clam shell mold which is held together with clamps during molding and curing of the composite shell. As set forth above, in one embodiment, Lunde teaches creating a vacuum between the inner surface of the clam shell and the composite shell. Further, Lunde suggests that a vacuum source may be used during fiber placement to secure a bladder tightly against the mandrel so that it cannot move relative to the mandrel. See Lunde, col. 9, ll. 58-61).

The rejection is based on Murphy as a primary reference stating that Murphy teaches all of the limitations of Applicants' claim 1 except for applying a vacuum such that said plurality of fiber reinforced pre-preg does not contact the mold. The rejection further states the Lunde teaches placing a wrapped assembly in a clamshell mold (vacuum chamber having a forming die), removing the mandrel body and

pressurizing the bladder while heating to thereby cure and force the pre-preg against the interior of the mold. Further, the Examiner states that Lunde teaches applying a vacuum to the mandrel body hence compacting the pre-preg around the mandrel.

To establish a *prima facie* case of obviousness for a claimed invention, all the claim limitations must be taught or suggested by the prior art. *In re Royka*, 490 F.2d 981, 180 USPQ 580 (CCPA 1974). Here, the combination of the Murphy and Lunde do not teach or suggest a method including inserting a composite body including an internal-pressure holding tube and a prepreg into a vacuum chamber containing a forming die and evacuating the vacuum chamber in an isolation state where the composite body and the forming die do not contact each other as recited in claim 1. Lunde discloses applying a vacuum source to the mandrel during a step of fiber placement to secure the bladder tightly against the mandrel. Nothing in the combination of Murphy and Lunde teach or suggest the method of claim 1 including evacuating a vacuum chamber containing both a forming die and a composite body positioned within the forming die wherein the composite body and the forming die do not contact each other. Further, nothing in the combination of Murphy and Lunde teach or suggest a vacuum chamber as set forth in the application and required for the method of claim 1.

Since all of the limitations of Applicants' claim 1 are not taught or suggested by the combination of Murphy and Lunde, claim 1 is not obvious under 35 U.S.C. § 103(a) over the combination of Murphy and Lunde. Accordingly, the rejection of claim 1 under 35 U.S.C. § 103(a) should be withdrawn.

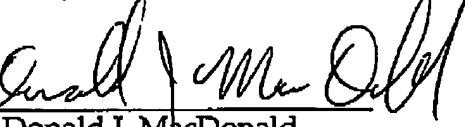
Claims 2-5 depend either directly or indirectly from claim 1, and also recite additional limitations. Since claim 1 is not obvious over Murphy in view of Lunde, for at least the above-identified reasons, dependent claims 2-5 are also not obvious over the combination of Murphy and Lunde. Therefore, the rejection of claims 2-5 under 35 U.S.C. § 103(a) should also be withdrawn.

CONCLUSION

In view of the foregoing, it is respectfully submitted that claims 1-5 are in condition for allowance. All issues raised by the Examiner having been addressed, an early action to that effect is earnestly solicited.

No fees or deficiencies in fees are believed to be owed in connection with filing this Response. However authorization is hereby given to charge our Deposit Account No. 13-0235 in the event any such fees are owed.

Respectfully submitted,

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